CLAIMS

What is Claimed is:

1. A fuel cell system comprising:

a compressor for generating a compressed air flow;

a fuel cell stack responsive to the compressed air flow and generating a cathode exhaust gas flow; and

a two-position valve responsive to the exhaust gas flow, wherein the valve is open if the operating temperature of the system is below a predetermined temperature and the valve is closed if the operating temperature of the system rises above the predetermined temperature so that the exhaust gas back-pressure increases to provide humidity control.

2. The system according to claim 1 further comprising a fixed restriction valve in parallel with the two-position valve, said fixed restriction valve also being responsive to the exhaust gas flow, said fixed restriction valve providing a predetermined cathode exhaust gas back-pressure when the two-position valve is closed.

3. The system according to claim 1 wherein the two-position valve includes leak paths to allow the exhaust gas to flow therethrough when the two-position valve is closed.

4. The system according to claim 1 further comprising a controller, said controller controlling the position of the two-position valve in response to the operating temperature of the system.

5. The system according to claim 4 wherein the controller prevents rapid switching of the two-position valve.

6. The system according to claim 1 wherein the two-position valve has a relatively slow transition time so as to prevent rapid changes between the open and closed position.

7. The system according to claim 6 wherein the two-position valve has about a 500 ms transition time.

8. The system according to claim 6 wherein the slow transition time is provided by one of a mechanical dash-pot or electrical control.

9. The system according to claim 1 wherein the fuel cell system is on a vehicle.

10. A fuel cell system comprising:

a compressor for generating a compressed air flow;

a fuel cell stack responsive to the compressed air flow and generating a cathode exhaust gas flow at a cathode output of the fuel cell stack;

a two-position discrete valve responsive to the cathode exhaust gas flow, said two-position valve having a first position for providing a low back-pressure at the cathode output and a second position for providing a high back-pressure at the cathode output;

a fixed restriction valve responsive to the cathode exhaust gas flow, said fixed restriction valve providing the high back-pressure when the two-position valve is in the second position; and

a controller, said controller switching the two-position valve between the first position and the second position in response to the operating temperature of the fuel cell stack so that the fuel cell stack has the proper relative humidity.

11. The system according to claim 10 wherein the fixed restriction valve is a separate valve than the two-position valve and is in parallel with the two-position valve.

12. The system according to claim 10 wherein the fixed restriction valve is part of the two-position valve and provides leak paths through the two-position valve when the two-position is in the second position.

13. The system according to claim 10 wherein the controller prevents rapid switching of the two-position valve.

14. The system according to claim 10 wherein the two-position valve has a relatively slow transition time so as to prevent rapid switching of the valve.

15. The system according to claim 14 wherein the two-position has a 500 ms transition time.

16. The system according to claim 14 wherein the slow transition time is provided by one of a mechanical dash-pot or electrical control.

17. The system according to claim 10 wherein the fuel cell system is on a vehicle.

18. A method for controlling the relative humidity in a fuel cell system, said method comprising:

applying a compressed air flow to a cathode input of a fuel cell stack; and

controlling the pressure within the fuel cell stack by controlling the back-pressure of a cathode exhaust gas flow from the fuel cell stack, wherein controlling the pressure within the fuel cell stack includes directing the exhaust

gas flow through a two-position valve having a first position for providing a low back-pressure if the operating temperature of the system is below a predetermined temperature and a second position providing a high back-pressure if the operating temperature of the system rises above the predetermined temperature.

19. The method according to claim 18 wherein controlling the pressure within the fuel cell stack further includes providing a fixed restriction valve in parallel with the two-position valve so that the fixed restriction valve provides the high back-pressure when the two-position valve is in the second position.

20. The method according to claim 18 wherein controlling the pressure in the fuel cell stack includes providing specially sized leak paths in the two-position valve to provide the high back-pressure when the two-position valve is in the second position.

21. The method according to claim 18 wherein controlling the pressure within the fuel cell stack includes preventing rapid switching of the two-position valve between the first position and second position.